REMARKS

Claims 17-43 are pending in the present application and stand rejected on a variety of grounds. Each of the Examiner's objections is addressed below.

Specification

The Examiner objected to the specification for failing to provide proper antecedent basis for the claimed subject matter. In particular, the Examiner found that Claims 18, 19, 34, 35 and 43 were confusing and gave the impression that a number of individual purging steps were being performed each cycle, rather than that a number of gas volumes of the reaction chamber were being removed during a single purge step as disclosed in the specification.

Claims 18, 19, 34, 35 and 43 have been amended to clarify that the given gas volume of the reaction space is being removed during the interval between reactant feeds in each cycle. No new matter is introduced by these amendments.

In view of the clarifying amendments, Applicants request withdrawal of the objection to the specification.

Claim Rejections Under 35 U.S.C. §112

Claims 30 and 31 were rejected under 35 U.S.C. §112, second paragraph, as the term "the apparatus" was found to lack antecedent basis. These claims have been amended to recite "the method," which finds antecedent basis in Claim 27, from which they depend. In view of this amendment, Applicants request withdrawal of the rejection.

Claim 32 was rejected under 35 U.S.C. §112, second paragraph, as being indefinite in view of the recitation of "at least essentially laminar flow." The Examiner found that it is unclear what the phrase is meant to encompass.

Claim 32 is amended herein to recite "a laminar flow." Applicants submit that as one of ordinary skill in the art will be able to determine the scope of "a laminar flow" the rejection should be withdrawn.

Claim Rejections Under 35 U.S.C. §102

Claims 17, 20-22, 24 and 25 were rejected under 35 U.S.C. §102(b) as anticipated by Sakuma et al. (U.S. Patent No. 5,270,247). The Examiner found that Sakuma et al. teaches an ALD process with purging between cycles to evacuate the process chamber.

Applicants respectfully submit that there is no teaching or suggestion in Sakuma et al. to evacuate "a gas volume of the reaction chamber" essentially totally in the interval between reactant pulses as claimed. The mere teaching of purging between cycles does not suggest that an entire gas volume of the reaction chamber is evacuated.

Sakuma teaches that with respect to the purge step, the time for which the purge gas is supplied "is limited within a certain range such that the already absorbed V-group atoms are not removed" (Column 3, lines 34-39). Further, Sakuma et al. teaches that "By utilizing a hydrogen gas for purging, the separation of the different source gases is made more complete in a shorter time..." (column 5, lines 35-38, emphasis added) in order to prevent damage to the already formed interface layer. Thus, while Sakuma et al. does teach utilizing a purge gas, the time of the purge is *minimized* to prevent damage to the previously adsorbed layer.

As there is no suggestion to purge a gas volume of the reaction space in the interval between reaction pulses, Applicants request withdrawal of the rejection of Claim 17. Claims 20-22, 24 and 25 depend from Claim 17 and have all of the features thereof, in addition to further distinguishing features. Thus, the rejection of Claims 20-22, 24 and 25 over Sakuma et al. should be withdrawn as well.

Claims 17-19, 22, 24, 25 and 32-35 were rejected under 35 U.S.C. §102(e) as anticipated by Yokoyama et al. (U.S. Patent No. 5,483,919). Yokoyama teaches an ALE process that uses a purge gas to evacuate the process chamber. The Examiner states that "the reactant is fed to fill the chamber and the purging step lasts three times longer (column 4, lines 5-10)."

It appears that the Examiner is concluding that the teaching of a purge step that is three times longer than the time period for providing reactant will necessarily evacuate three gas volumes from the reaction space. Applicants disagree.

First, there is no teaching that the reactant fills the chamber in each reactant pulse. To the contrary, one of skill in the art will recognize from the disclosure that the reaction chamber is *not*

filled completely during each reactant pulse. The reactors disclosed in Figures 1, 8 and 9 have a reaction space 8 with an enormous volume compared to the size of the substrate 7. The gas inlet tubes 32 are clearly directed to deliver the reactant gas to the surface of the substrate. Thus, it is not necessary, or practical to fill the entire reaction space with reactant during each pulse. Rather, the skilled artisan familiar with ALE will readily appreciate that enough reactant need be provided to saturate the substrate surface. This will be a significantly smaller volume than the volume that would be required to fill the entire chamber.

Without a teaching that the reactant pulse completely fills the chamber, there is no way to determine how much of the chamber is evacuated during a purge step that is three times as long in duration. In view of the large chamber disclosed in Yokoyama one of skill in the art cannot conclude that the chamber is completely, or even one-third filled upon pulsing of source gas. Thus, there is no teaching or suggestion that the purge step will evacuate even one gas volume of the reaction space.

As Yokoyama et al. do not teach or suggest removing one or more gas volumes of the reaction space during the interval between reactant pulses, Applicants submit that Claims 17-19, 22, 24, 25 and 32-35 are not anticipated. Thus, the rejection under 35 U.S.C. §102(e) should be withdrawn.

Claim Rejections Under 35 U.S.C. §103(a)

Claims 26-31 were rejected under 35 U.S.C. §103(a) as obvious over the combination of Sakuma et al. and Yokoyama et al. as applied to Claim 17, in view of Moore (U.S. Patent No. 3,662,583).

As discussed above, neither Sakuma et al. nor Yokoyama et al. disclose evacuating a gas volume of the reaction space in an interval between successive reactant pulses as recited in Claim 17. Moore does not cure this deficiency. Claims 26-31 each depend from Claim 17 and have all the features thereof. Thus, Applicants submit that the rejection should be withdrawn.

Claims 18-19, 23 and 33-43 were rejected under 35 U.S.C. §103(a) as obvious in view of Sakuma et al. With respect to Claims 18-19, 23 and 33-40, the Examiner found that Sakuma et al. teaches each of the limitations of Claim 17 but is silent as to the additional features recited in

these dependent claims. As discussed above, Sakuma et al. do not teach or suggest evacuating even one gas volume of the reaction space in an interval between successive reactant pulses. As a result, all of the limitations of Claim 17 are not taught. As Claims 18-19, 23 and 33-40 each depend from Claim 17 and contain all of the features thereof, in addition to further distinguishing features, Applicants submit that they are not obvious in view of Sakuma et al.

With respect to Claims 41-43, the Examiner found that "the reference fails to explicitly teach purging the second feed line while the reactant is flowed through the first feed line." However, as discussed above, Applicants submit that Sakuma et al. fail to teach or suggest evacuating a gas volume of the reaction space in an interval between two successive pulses of reactants, as recited in independent Claim 41. The Examiner has provided no teaching that would make up for this deficiency. As a result, Applicants submit that the present rejection of Claim 41 should be withdrawn. Further, as Claims 42 and 43 depend from Claim 41, they contain all the features thereof, in addition to further distinguishing features. Accordingly, the rejection of these claims over Sakuma et al. should be withdrawn as well.

Double Patenting

The Examiner has rejected Claims 17-29 and 32-35 under the judicially created doctrine of obviousness-type double patenting over Claims 1-10 of U.S. Patent No. 6,015,590. A Terminal Disclaimer is provided herewith. In view of the Terminal Disclaimer, Applicants submit that the present rejection should be withdrawn.

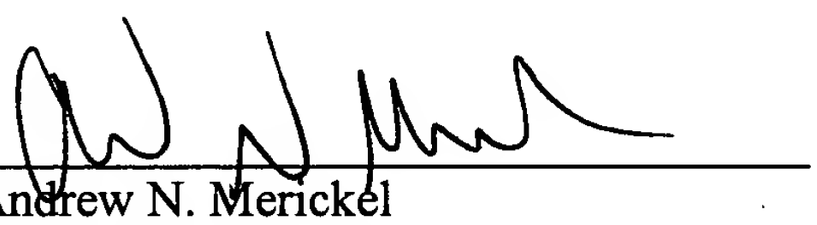
Conclusion

In view of the arguments presented above, Applicants submit that the present application is in condition for allowance. If any issues remain, the Examiner is invited to contact Applicants' representative at the number provided below in order to resolve such issues promptly.

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

Dated: November 25, 2003

By: 

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